**How NGOs Shape Agricultural Technology Dissemination in Coastal Andhra Pradesh of India? : A Review**

**ABSTRACT**

In India, agricultural development is a major factor in both economic expansion and the enhancement of rural livelihoods. Non-governmental organizations (NGOs) have become essential middlemen in the spread of agricultural innovations, especially in areas with limited resources and a rural population. Their contribution to market facilitation, technology transfer, capacity building, and consulting services has been crucial in closing the gap between agricultural communities and research institutes. The contributions of NGOs to the advancement of agricultural innovations in Andhra Pradesh's North Coastal area with a variety of agroclimatic conditions and socioeconomic dynamics are the main focus of this research. This study aims to give a thorough knowledge of NGO-led agricultural extension and its potential to improve farmer productivity, sustainability, and rural lives by examining case studies and current research. The results will be used to inform strategies and policy suggestions for enhancing NGO contributions in agricultural development. The study investigates the socioeconomic characteristics of farmers who gain from NGO initiatives, looking at variables that affect technology adoption, including income status, landholding size, education levels, and extension contacts. Additionally, it evaluates important factors that affect NGO effectiveness, such as partnerships, governance, community involvement, organizational capability, and technology integration. To learn more about farmers' perspectives, levels of trust, and readiness to embrace new farming methods, their attitudes toward NGO-led projects are examined. NGOs encounter several obstacles in spite of their noteworthy contributions, such as insufficient financial resources, administrative restraints, technology restrictions, and opposition from traditional agricultural groups. In order to increase the efficacy of agricultural technology distribution, this study emphasizes the necessity of developing NGO capacity, improving digital tools for extension, encouraging multi-stakeholder cooperation, and putting supporting policies into place. This assessment offers useful insights for policymakers, development practitioners, and extension experts who want to improve sustainable agricultural development through NGO-led efforts by assessing the current framework and pinpointing opportunities for improvement.

**Keywords**: Agriculture, Community Engagement, Market Linkages, North Coastal Andhra Pradesh, NGOs, Technology Transfer.

**1. INTRODUCTION**

Agricultural technologies have long been promoted by governments and development organizations as effective ways to increase farm productivity and reduce poverty. However, the adoption of many seemingly beneficial technologies remains low (Ruzzante et al., 2021). In India, agricultural development is a major factor in both economic expansion and the enhancement of rural livelihoods. The effective transfer of agricultural technology among farmers is a major factor in the success of agricultural transformation (Saha & Bahal 2015). Technologies like AI-driven precision agriculture, blockchain for traceability, and renewable energy applications are transforming resource efficiency and sustainability, driving agricultural growth (Huang & Wang, 2024). However, the successful transmission and acceptance of these technologies are frequently hampered by a number of obstacles, including a lack of knowledge, insufficient extension services, and socioeconomic limitations (Barakabitze *et al.,* 2015). Non-Utilization of digital tools increases the adoption of innovations through improving the ability of the farmers to take up new challenges, as well as guaranteeing access to beneficial sales outlets for their farm produce. Digitalization has led to an increase in food security while reducing agricultural environmental footprints (Izuogu et al., 2023). Governmental Organizations (NGOs) have become important change agents in this setting by establishing a link between farming communities, policymakers, and research institutions (Lewis *et al.,* 2020). The North Coastal Region of Andhra Pradesh, comprising the districts of Srikakulam and Vizianagaram, is characterized by diverse agro-climatic conditions, small and marginal landholdings, and a predominantly agrarian economy(Thirupalu & Muninarayanappa 2025). Farmers in this region face numerous challenges, including erratic rainfall, soil degradation, limited access to modern agricultural inputs, and market fluctuations. To address these issues, NGOs actively engage in technology dissemination, capacity building, farmer training, and sustainable agricultural practices (Copestake & Wellard 2024). The purpose of this review study is to evaluate how NGOs contribute to the spread of agricultural innovations in Andhra Pradesh's North Coastal Region. It assesses NGOs' efficacy in influencing farmer adoption behaviour, their participation in information transmission, and their cooperation with extension agencies (Naik, 2014). The socioeconomic characteristics of the farmers who get the assistance, the obstacles that non-governmental organizations encounter, and the elements that influence their effectiveness in disseminating technology are also examined in this research (Mwangi, 2016). This study aims to give a thorough knowledge of NGO-led agricultural extension and its potential to improve farmer productivity, sustainability, and rural lives by examining case studies and current research (NGIDO, 2023). The results will be used to inform strategies and policy suggestions for enhancing NGO contributions in agricultural development (Farrington & Lewis 2014).

**2. Role of NGOs in Agricultural Technology Dissemination**

NGOs are essential to the spread of agricultural technology because they serve as a bridge between rural communities, extension offices, and research institutes. Their contributions are diverse and include technology transfer, market connections, consultancy services, farmer training, and capacity building (Ferris *et al.,* 2014). One of the main ways that NGOs help spread technology is by implementing capacity-building programs. They host workshops, field demonstrations, and training sessions to inform farmers about cutting-edge farming methods (Weimer, 2018). These initiatives support the adoption of sustainable and climate-resilient farming practices, increase farmers' technical expertise, and boost their ability to make decisions. NGOs also work to empower small-scale and marginal farmers by offering practical training that is adapted to meet their unique requirements (Nwaka & Nwaka 2021). The creation of Farmer Field Schools (FFS), where farmers receive experience learning, is a key extension strategy employed by NGOs (Butt *et al.,* 2015). By encouraging interactive education, these institutions give farmers hands-on experience with a range of technologies, including precision farming, integrated pest control, and soil health management (Athuman, 2023). By promoting peer-to-peer learning and group decision-making, the FFS model improves farmers' problem-solving skills (Shekmohammed *et al.,* 2023). NGOs offer advisory services by providing technical advice on better agricultural methods, input management, and climate adaption tactics in addition to training programs (Antwi-Agyei & Stringer 2021). These services include on-the-spot assistance via digital extension tools, farmer helplines, and mobile advisory platforms Kiambi, 2018). To guarantee that farmers obtain information that is both locally relevant and supported by science, several NGOs work with agribusiness companies, government extension agencies, and research institutes (Buadi *et al.,* 2013). NGOs are essential in helping farmers connect with markets in addition to imparting expertise. Nongovernmental organizations (NGOs) facilitate market access and price realization by linking smallholder farmers with buyers, cooperatives, and agribusiness companies (Wortmann, 2019). In order to increase farmers' negotiating power, boost value-added agricultural businesses, and enhance supply chain efficiency, they frequently create farmer producer organizations, or FPOs. Technology transfer is another crucial role of NGOs since they serve as a bridge between rural communities and research institutes (Shree & Vaishnavi 2022). NGOs support pilot programs and on-farm experiments to evaluate the viability of organic agricultural practices, precision agriculture, and novel crop types (Malik & Kajale 2024). By using participatory methods, they guarantee that technical advancements are economically feasible, socially acceptable, and tailored to local circumstances (Kumar & Nikhitha 2024). All things considered, NGOs are essential to closing the knowledge gap, enhancing farmers' technical proficiency, and promoting agricultural growth (Shrivastava & Shrivastava 2022). By making contemporary agricultural innovations more available to farming communities in Andhra Pradesh's North Coastal Region, their initiatives improve rural lives, increase the rate of adoption of new technologies, and contribute to food security (Shree & Vaishnavi 2022).

**3. Socio-Economic Profile of Beneficiary Farmers**

Farmers' socioeconomic traits have a big impact on their capacity to accept and use agricultural technology that is promoted by non-governmental organizations (NGOs). Comprehending these elements aids in evaluating how well NGO initiatives improve agricultural sustainability and production (Copestake & Wellard 2024). The effectiveness of technology distribution initiatives is largely dependent on important socioeconomic factors, including age, education, landholding size, income levels, extension contact, and social engagement (Lewis et al., 2020).

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| Socio-Economic Factor | Influence on Technology Adoption | NGO Interventions & Implications |
| Age | Adoption rates are greater among younger farmers (those under 40) because they are more flexible and receptive to new ideas. Traditional methods are typically used by older farmers (Liu et al., 2018). | NGOs work to improve long-term sustainability by including young farmers through leadership initiatives, contemporary training programs, and digital technologies (Bullock *et al.,* 2020). |
| Education | Secondary and higher educated farmers are more open to new technology and scientific farming practices. Extension message understanding is enhanced by literacy (Qin *et al.,* 2022). | To increase accessibility, NGOs support literacy initiatives, disseminate easily navigable resources, and offer mobile advising services (Unay-Gailhard & Brennen 2022). |
| Land Holding | Smallholders struggle with resource limitations, whereas large landowners have greater financial resources to test new technology (Woodhouse, 2013). | NGOs provide small and marginal farmers with group-based training, financial assistance, and subsidies as part of their tailored initiatives (Fan & Rue 2020). |
| Income Levels | Higher-income farmers are able to purchase contemporary inputs such as precision agriculture, automation, fertilizers, and HYV seeds. Farmers with low incomes find it difficult to make ends meet (Jack, 2013). | NGOs bring in cost-effective innovations including cooperative agricultural models, climate-resilient cropping methods, and inexpensive biofertilizers Masere, 2015). |
| Extension Contact | Regular engagement with agronomists, extension agents, and non-governmental organizations raises awareness and boosts confidence in implementing new methods (Agwu *et al.,* 2023). | NGOs provide digital advising platforms, farmer field schools, and community-based extension networks to guarantee consistent participation (Bandewar *et al.,* 2017). |
| Social Participation | Farmers that participate in cooperatives, farmer producer organizations, and self-help groups (SHGs) have greater rates of technology adoption because of the shared learning that occurs within these groups (Sennuga & Oyewole 2020). | NGOs promote collective bargaining tactics, peer-to-peer learning, and participatory decision-making as ways to improve social involvement (Arulmanikandan & Vaishnavi 2024). |

**Table 1:** Relationship Between Socio-Economic Factors and Agricultural Technology Adoption

**4. Factors Influencing NGO Performance in Agricultural Technology Dissemination**

Numerous variables influence how well NGOs operate in the distribution of agricultural technology and how well they bridge the gap between farmers and research institutes. Organizational capacity is important because extension activities may be carried out more effectively by NGOs with qualified staff and adequate funding (Banks *et al.,* 2015). Their capacity to implement and maintain agricultural innovations is improved by institutional support, financing availability, and well-trained extension workers.  Another important element affecting NGO success is community participation (Suvedi & Kaplowitz 2016). The effective adoption of new technology is enhanced when farmers actively engage in training and decision-making processes. NGOs tend to have a bigger influence on agricultural practices when they promote participatory approaches through interactive learning sessions and farmer field schools (Barakabitze *et al.,* 2017). NGOs are guaranteed to function honestly and produce outcomes effectively via effective governance and accountability. Organizations that have well-defined goals, accountable leadership, and transparent operational frameworks are better equipped to uphold stakeholder confidence, get funding, and carry out long-lasting initiatives (Lokman *et al.,* 2023). Agricultural extension services have been revolutionized by technological innovation, and in order to reach a larger audience, NGOs are increasingly using digital platforms, mobile-based advising systems, and ICT tools. Farmers are now able to make better decisions and share information in real time because of the combination of remote sensing, AI-driven analytics, and precision agriculture. Finally, partnerships and collaborations integrate the knowledge of academic institutions, commercial sector players, and government agencies to improve NGO projects (Ijeoma & Ezejiofor 2013). In the end, multi-stakeholder partnerships make technology diffusion initiatives more effective and long-lasting by improving resource mobilization, knowledge sharing, and market accessibility. The total efficacy of NGOs in improving rural lives and agricultural productivity is determined by the combined influence of these elements (Attipoe *et al.,* 2021).

**5. Constraints Faced by NGOs**

NGOs have a number of obstacles that limit their efficacy, despite the fact that they have made substantial contributions to the transmission of agricultural technology. Their capacity to carry out extensive interventions is frequently hampered by administrative issues, such as a lack of resources, lengthy bureaucratic processes, and intricate regulatory constraints (Gruber, 2023). Obtaining steady funding is still a significant challenge that impacts their ability to reach a wider audience and maintain operations. Technological limitations present serious difficulties in addition to administrative ones (Greenhalgh *et al.,* 2017). Access to contemporary technologies and digital platforms, which are essential for effective information distribution, is a problem for many NGOs. Additionally, farmers and field workers still struggle with digital literacy, which restricts their ability to effectively use cutting-edge agricultural technologies. In traditional agricultural communities, where opposition to change is prevalent, social and situational variablesalso have an influence on NGO-led projects (Maurel & Huyghe 2017). Due to ignorance, a fear of failing, or insufficient evidence of the advantages, farmers used to traditional methods may be reluctant to embrace new technology. It will need consistent community participation and trust-building activities to overcome these behavioural and cultural obstacles (Klerkx *et al.,* 2019). NGOs also face further challenges from commercial and policy-related concerns. It is challenging for NGOs to develop long-term, scalable solutions because of unstable agricultural policy, erratic government assistance, and market instability. The adoption process of technology is further slowed down by policy gaps and a lack of coordinated efforts between NGOs and government agencies. Improving the influence of NGOs in the distribution of agricultural technology requires addressing these limitations via better cooperation, regulatory changes, and strategic planning (Rouhi *et al.,* 2019).

**6. Farmers’ Attitude Towards NGOs**

Agricultural technology adoption is greatly impacted by farmers' perceptions of NGOs, which also have a direct impact on the effectiveness of dissemination initiatives. Farmers' faith and confidence in NGO-led projects are based on the programs' execution being inclusive, consistent support, observable benefits, and participatory decision-making. Farmers are more inclined to embrace new technology with assurance when NGOs continue to participate on a regular basis through follow-ups and advice services (Leiderer, 2015). Farmers' confidence in these treatments is further bolstered by proving quantifiable increases in revenue and productivity. Furthermore, farmers believe that their traditional methods are respected rather than displaced when local knowledge is included and cultural significance is ensured, which increases acceptability. Long-term sustainability and a sense of ownership are promoted by a participatory strategy in which farmers actively participate in decision-making and execution. Enhancing these elements not only changes farmers' opinions but also increases NGOs' overall influence in the spread of agricultural technology (Mills *et al.,* 2017).

**7. Future Prospects and Recommendations**

The future of agricultural technology distribution led by NGOs hinges on bolstering institutional capacity, utilizing digital innovations, cultivating policies that are favourable, and encouraging community-driven projects (Berkhemer *et al.,* 2015). Continuous training to improve the technical proficiency of farmers and NGO staff guarantees efficient knowledge transmission. Reach and efficiency may be increased by using digital tools like remote sensing technology, AI-driven advisory services, and mobile applications (Wishart *et al.,* 2018). Securing long-term funding and expediting regulatory procedures require strong policy support through government-NGO partnerships. Long-term sustainability is promoted, and the effectiveness of agricultural interventions is increased by empowering farmer cooperatives and self-help organizations to take charge of technology adoption. A more effective, inclusive, and technologically advanced approach to agricultural growth will be ensured by fortifying these key sectors (Marrero et al., 2018).

**8. Conclusion**

NGOs have been an essential part in the spread of agricultural technology in Andhra Pradesh's North Coastal Region, helping to bridge the gap between scientific research and the local farming community. Their proactive involvement in market connections, technology transfer, advising services, and capacity building has greatly improved agricultural sustainability and production (Wishart *et al.,* 2018). NGOs have been essential in updating the agricultural environment by encouraging information sharing and equipping farmers with creative techniques. However, administrative difficulties, budgetary constraints, technology gaps, and socioeconomic impediments frequently restrict their influence. The smooth implementation of new technology is hampered by a lack of finance, administrative roadblocks, farming communities' aversion to change, and a lacklustre digital infrastructure. Stronger partnerships between NGOs, governmental organizations, academic institutions, and private entities are crucial to addressing these issues. Technology diffusion may be greatly improved by a more inclusive and integrated strategy that makes use of cutting-edge digital solutions like artificial intelligence, mobile-based extension services, and precision farming instruments. Policies must be developed going forward to support NGOs by guaranteeing sufficient financing, efficient administrative procedures, and capacity-building programs for extension agents. To boost acceptance and adoption rates, community-driven strategies like farmer cooperatives and participatory decision-making should be promoted (Mohyuddin *et al.,* 2024). NGOs may continue to have a revolutionary impact on the agriculture sector by overcoming current obstacles and establishing multi-stakeholder collaborations. In the end, their persistent work will help create an agricultural system that is more robust, technologically advanced, and sustainable, enhancing farmer livelihoods and guaranteeing long-term food security.

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**REFERENCES:**

1. Saha, B., & Bahal, R. (2015). Factors leading to success in diversified occupation: A Livelihood analysis in India. The Journal of Agricultural Education and Extension, 21(3), 249-266.
2. Barakabitze, A. A., Kitindi, E. J., Sanga, C., Shabani, A., Philipo, J., & Kibirige, G. (2015). New technologies for disseminating and communicating agriculture knowledge and information: Challenges for agricultural research institutes in Tanzania. The Electronic Journal of Information Systems in Developing Countries, 70(1), 1-22.
3. Lewis, D., Kanji, N., & Themudo, N. S. (2020). Non-governmental organizations and development. Routledge.
4. Thirupalu, H., & Muninarayanappa, M. (2025). DEVELOPMENT INITIATIVES AND SOCIAL CHANGE OF SCHEDULED CASTES. Ashok Yakkaldevi.
5. Copestake, J. G., & Wellard, K. (Eds.). (2024). Non-Governmental Organizations and the State in Africa: rethinking roles in sustainable agricultural development.
6. Naik, V. R. (2014). Effectiveness and Impact Analysis of Innovative Information and Communication Technology Based Extension Models (Doctoral dissertation, Doctoral Dissertation, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi).
7. **Mwangi, J. (2016). Factors Influencing Horticultural Production In Kenya: A Case Of Farmers Sponsored By Non-Governmental Organizations In Muranga County, Kenya (Doctoral dissertation, University of Nairobi).**
8. **NGIDO, M. (2023). Assessment of the Role of Ngos in Promoting Sustainable Agriculture Development in Tanzania (Doctoral dissertation, IAA).**
9. **Farrington, J., & Lewis, D. J. (2014). Non-governmental organizations and the state in Asia: Rethinking roles in sustainable agricultural development. Routledge.**
10. **Ferris, S., Robbins, P., Best, R., Seville, D., Buxton, A., Shriver, J., & Wei, E. (2014). Linking smallholder farmers to markets and the implications for extension and advisory services. MEAS Brief, 4(10), 13-14.**
11. **Weimer, S. W. (2018). Enabling, Managing, and Leveraging Organizational Learning for Innovation-A Case Study of the USAID Feed the Future Innovation Lab for Collaborative Research Program Network.**
12. **Nwaka, S., & Nwaka, S. (2021). Social and Technological Innovation in Africa. Springer Singapore.**
13. **Butt, T. M., Gao, Q., & Hussan, M. Z. Y. (2015). An analysis of the effectiveness farmer field school (FFS) approach in sustainable rural livelihood (SRL): The experience of Punjab-Pakistan. Agricultural Sciences, 6(10), 1164-1175.**
14. **Athuman, J. J. (2023). Fostering sustainable agriculture through integrated agricultural science education: General overview and lessons from studies. Research and Reviews in Agriculture Science Volume I, 1.**
15. **Shekmohammed, S., Hany, U., & Lemma, S. (2023). Review of farmers field school approach for facilitation of climate smart agriculture. International Journal of Agriculture and Veterinary Sciences, 5, 9-17.**
16. **Antwi-Agyei, P., & Stringer, L. C. (2021). Improving the effectiveness of agricultural extension services in supporting farmers to adapt to climate change: Insights from northeastern Ghana. Climate Risk Management, 32, 100304.**
17. **Kiambi, D. (2018). The use of information communication and technology in advancement of African agriculture. African Journal of Agricultural Research, 13(39), 2025-2036.**
18. **Buadi, D. K., Anaman, K. A., & Kwarteng, J. A. (2013). Farmers’ perceptions of the quality of extension services provided by non-governmental organisations in two municipalities in the Central Region of Ghana. Agricultural Systems, 120, 20-26.**
19. **Wortmann-Kolundžija, E. (2019). Empowering Smallholder Farmers through Farmer Organizations.**
20. **Shree, D. N., & Vaishnavi, P. (2022). Challenges faced by farmer producer organisations (FPOs)-A review. Journal of Agricultural Extension Management, 23(1), 131-138.**
21. **Malik, S., & Kajale, D. (2024). Empowering small and marginal farmers: Unveiling the potential and addressing obstacles of farmer producer organizations in India. Research on World Agricultural Economy, 5(1), 32-47.**
22. **Kumar, P. G., & Nikhitha, A. (2024). A theoretical perspective of producer organisations in India.**
23. **Shrivastava, S., Jat, M., & Shrivastava, K. (2022). Present status, role and challenges of Farmer Producer Organization. Asian Journal of Agricultural Extension, Economics & Sociology, 40(8), 39-47.**
24. **Shree, D. N., & Vaishnavi, P. (2022). Challenges faced by farmer producer organisations (FPOs)-A review. Journal of Agricultural Extension Management, 23(1), 131-138.**
25. **Copestake, J. G., & Wellard, K. (Eds.). (2024). Non-Governmental Organizations and the State in Africa: rethinking roles in sustainable agricultural development.**
26. **Lewis, D., Kanji, N., & Themudo, N. S. (2020). Non-governmental organizations and development. Routledge.**
27. **Liu, T., Bruins, R. J., & Heberling, M. T. (2018). Factors influencing farmers’ adoption of best management practices: A review and synthesis. Sustainability, 10(2), 432.**
28. **Bullock, R., Huyer, S., Shai, T., & Nyasimi, M. (2020). The CCAFS youth and climate-smart agriculture (CSA) strategy.**
29. **Qin, T., Wang, L., Zhou, Y., Guo, L., Jiang, G., & Zhang, L. (2022). Digital technology-and-services-driven sustainable transformation of agriculture: Cases of China and the EU. Agriculture, 12(2), 297.**
30. **Unay-Gailhard, İ., & Brennen, M. A. (2022). How digital communications contribute to shaping the career paths of youth: a review study focused on farming as a career option. Agriculture and Human Values, 39(4), 1491-1508.**
31. **Fan, S., & Rue, C. (2020). The role of smallholder farms in a changing world. The role of smallholder farms in food and nutrition security, 13-28.**
32. **Jack, B. K. (2013). Market inefficiencies and the adoption of agricultural technologies in developing countries.**
33. **Masere, T. P. (2015). An evaluation of the role of extension in adoption of new technology by small-scale resource-constrained farmers: A case of Lower Gweru Communal area, Zimbabwe (Doctoral dissertation, University of KwaZulu-Natal, Pietermaritzburg).**
34. **Agwu, A. E., Suvedi, M., Chanza, C., Davis, K., Oywaya-Nkurumwa, A., Najjingo Mangheni, M., & Sasidhar, P. V. K. (2023). Agricultural Extension and Advisory Services in Nigeria, Malawi, South Africa, Uganda, and Kenya. Partnerships for Innovative Research in Africa (PIRA) Research Report. East Lansing, Michigan, USA: Alliance for African Partnership, Michigan State University.**
35. **Bandewar, S. V., Wambugu, F., Richardson, E., & Lavery, J. V. (2017). The role of community engagement in the adoption of new agricultural biotechnologies by farmers: the case of the Africa harvest tissue-culture banana in Kenya. BMC biotechnology, 17, 1-11.**
36. **Sennuga, S. O., & Oyewole, S. O. (2020). Exploring the effectiveness of agricultural technologies training among smallholder farmers in Sub-Saharan African communities. European Journal of Training and Development Studies, 7(4), 1-15.**
37. **Arulmanikandan, B., & Vaishnavi, P. (2024). Transformative Influence of Innovative Agricultural Extension Services on Rural Communities. Dr. KL Chaudhary, 1.**
38. **Banks, N., Hulme, D., & Edwards, M. (2015). NGOs, states, and donors revisited: Still too close for comfort?. World development, 66, 707-718.**
39. **Suvedi, M., & Kaplowitz, M. D. (2016). What every extension worker should know: Core competency handbook (pp. 7-22). East Lansing, MI: Michigan State University, Department of Community Sustainability.**
40. **Barakabitze, A. A., Fue, K. G., & Sanga, C. A. (2017). The use of participatory approaches in developing ICT‐based systems for disseminating agricultural knowledge and information for farmers in developing countries: The case of Tanzania. The Electronic Journal of Information Systems in Developing Countries, 78(1), 1-23.**
41. **Lokman, N., Othman, S., & Kamal, N. A. M. (2023). Governance, accountability and transparency level of non-profit organisation: a study of Malaysian foundations. International Journal of Business and Technology Management, 5(1), 304-318.**
42. **Ijeoma, N., & Ezejiofor, R. A. (2013). An Appraisal of corporate governance issues in enhancing transparency and accountability in small and medium enterprises (SME). International Journal of Academic Research in Business and Social Sciences, 3(8), 162.**
43. **Attipoe, S. G., OPOKU-KWANOWAA, Y., & OHENE-SEFA, F. (2021). Assessing the impact of non-governmental organization’s extension programs on sustainable cocoa production and household income in Ghana. Journal of Integrative Agriculture, 20(10), 2820-2836.**
44. **Gruber, J. (2023). Controlling bureaucracies: Dilemmas in democratic governance. Univ of California Press.**
45. **Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., Hinder, S., ... & Shaw, S. (2017). Beyond adoption: a new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. Journal of medical Internet research, 19(11), e8775.**
46. **Maurel, V. B., & Huyghe, C. (2017). Putting agricultural equipment and digital technologies at the cutting edge of agroecology. Ocl, 24(3), D307.**
47. **Klerkx, L., Jakku, E., & Labarthe, P. (2019). A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. NJAS-Wageningen journal of life sciences, 90, 100315.**
48. **Rouhi, N., Gorji, H. A., & Maleki, M. (2019). Nongovernmental organizations coordination models in natural hazards: A systematic review. Journal of education and health promotion, 8(1), 44.**
49. **Leiderer, S. (2015). Donor coordination for effective government policies?. Journal of International Development, 27(8), 1422-1445.**
50. **Mills, J., Gaskell, P., Ingram, J., Dwyer, J., Reed, M., & Short, C. (2017). Engaging farmers in environmental management through a better understanding of behaviour. Agriculture and human values, 34, 283-299.**
51. **Berkhemer, O. A., Fransen, P. S., Beumer, D., Van Den Berg, L. A., Lingsma, H. F., Yoo, A. J., ... & Dippel, D. W. (2015). A randomized trial of intraarterial treatment for acute ischemic stroke. New England Journal of Medicine, 372(1), 11-20.**
52. **Marrero, J. A., Kulik, L. M., Sirlin, C. B., Zhu, A. X., Finn, R. S., Abecassis, M. M., ... & Heimbach, J. K. (2018). Diagnosis, S taging, and M anagement of H epatocellular C arcinoma: 2018 P ractice G uidance by the A merican A ssociation for the S tudy of L iver D iseases. Hepatology, 68(2), 723-750.**
53. **Wishart, D. S., Feunang, Y. D., Guo, A. C., Lo, E. J., Marcu, A., Grant, J. R., ... & Wilson, M. (2018). DrugBank 5.0: a major update to the DrugBank database for 2018. Nucleic acids research, 46(D1), D1074-D1082.**
54. **Wishart, D. S., Feunang, Y. D., Guo, A. C., Lo, E. J., Marcu, A., Grant, J. R., ... & Wilson, M. (2018). DrugBank 5.0: a major update to the DrugBank database for 2018. Nucleic acids research, 46(D1), D1074-D1082.**
55. **Huang, W., & Wang, X. (2024). The impact of technological innovations on agricultural productivity and environmental sustainability in China. *Sustainability*, *16*(19), 8480.**
56. **Izuogu, C. U., Njoku, L. C., Olaolu, M. O., Kadurumba, P. C., Azuamairo, G. C., & Agou, G. D. (2023). A review of the digitalization of agriculture in Nigeria. *Journal of Agricultural Extension*, *27*(2), 47-64.**
57. **Ruzzante, S., Labarta, R., & Bilton, A. (2021). Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature. *World development*, *146*, 105599.**